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PROTEIN SUPPLIES IN UGANDA*

By R. F. A. DEAN

IN OPENING the Conference, Mr. S. Kalubya (Mayor of Kampala) said that although Uganda was a very fertile country, there was a great deal of malnutrition, much of it attributable to a shortage of protein, and the Conference would perform a useful service if it could indicate how the situation might be improved. The better distribution of foods might be of great importance. Large increases in animal production were desirable, but could only be achieved by the better feeding of the animals and it should be remembered that high yields are often achieved by giving the animals food that could be eaten by man. Agricultural, veterinary and medical science should all work together for the common end of the abolition of malnutrition. Every section of the community, and the whole way of life, should be studied.

The first three papers gave an account of the nutrition of different groups. Professor D. B. Jelliffe (Paediatric Department, Makerere Medical School) emphasized the importance of a good diet for the pregnant and lactating mother and the great need to maintain breast feeding which provided an ample and perfect supply of infant food and was one of the country's most valuable protein resources. Unfortunately, many women were tending to curtail breast feeding and their children suffered because the foods offered at the time of weaning were inadequate. The increase in bottle feeding was a disaster: far too often young children were given dilute cow's milk, teeming with pathogenic bacteria and the results showed plainly in the increasing numbers of very ill children, wasted with diarrhoeic disease, that were being brought to hospital, often to die. The lack of good feeding in the months following weaning gave rise to kwashiorkor and to other forms of protein-calorie malnutrition that were illustrated by Dr. R. F. A. Dean (Medical Research Council, Infantile Malnutrition Research Unit, Kampala). At the Unit's rural Clinic, at Namulonge, 16 miles north of Kampala, about 20 per cent of the children aged one to three years showed signs of malnutrition and the admission of cases of kwashiorkor to local hospitals, although they amounted to several hundred in every year, represented only a small part of the total problem. The chief cause was that the children's diet was overloaded with carbohydrate and very poor in protein: it reduced the splendid, sturdy breast-fed infants, usually in advance of European children in development, to sad little creatures whose growth might almost stop completely for a year or more. In the badly fed child the recovery from even

* An account of a Conference, arranged by the Scientific Committee on Human Nutrition, Uganda Government, at the Medical School, Makerere University College, Kampala, on 24th and 25th April, 1961.

minor illnesses was slow and uncertain. Frequently the child's nutrition was made worse by his separation from the mother, for superstitious or customary reasons.

Dr. S. Hall (Ross Institute, Kampala) said that critical studies were needed to define exactly the adequacy of the protein intakes of various groups in Uganda, especially adolescent and juvenile manual workers. If the Labour Department's minimum scale were followed, the diet (which contained at least 10 g. animal protein) would be adequate, but the recent trend to pay a consolidated wage instead of a wage and rations might be a danger if it led to the buying of cheap, unbalanced diets: he had obtained dietary histories of men who did not normally buy any animal protein. If the consolidated wage had to meet the food requirements of the whole of the worker's family, his young children might show the bad results of his too economical practices.

The Conference then turned to the consideration of the production of protein. Mr. D. G. Thomas and Mr. S. K. Mukasa, of the Kawanda Research Station, Agricultural Department (in a paper read by Mr. Mukasa), summarized the position regarding vegetable protein. About one-sixth of the total of 6.3 million cultivated acres in Uganda were occupied by grain legumes, of which groundnuts and kidney beans were the most important, followed by cow peas, pigeon peas and field peas. In areas of good rainfall they supplemented cooking bananas, sweet potatoes and cassava; in the drier parts the chief staple was finger millet. Every district grew legumes and staples in proportions dependent on climatic conditions, the quality of the local soils and tribal preferences. Groundnuts were valuable as a food crop and also as a cash crop. Rosette, a virus disease, was a danger, but could be controlled by close spacing. Introductions of new varieties had been successful and efforts were being made to establish a surplus for export. The labour requirement for groundnuts was high and large-scale production would be greatly enhanced by mechanization. In wet areas several crops of kidney beans (*Phaseolus vulgaris*) could be grown in a year. There was a fairly large export trade. Selection for disease resistance was needed and storage was often unsatisfactory because insecticides were not used. The soya bean could be a rich source of protein, but attempts to establish the crop on a large scale in Uganda had failed. In conclusion, Mr. Mukasa said that the chief need was not for increased amounts of vegetable protein but for better use of the amounts already available.

Dr. D. H. L. Rollinson (Animal Health Research Centre, Entebbe) spoke of animal protein. There were many difficulties in the estimation of production: research in his Centre had shown that the usually accepted figures of 280 lb., 20 lb. and 15 lb. for the meat yield of cattle, goats and sheep should be revised to 193 lb., 19.5 lb. and 13.8 lb., a very large difference for the cattle; similarly, guesses at the milk supply gave answers that ranged from 44 to 99 pints of milk available per head of the human population per year. Off-take can probably be estimated accurately by the figures for hides and skins and in 1960 was 17 per cent for cattle, 18 per cent for goats and 49 per cent

for sheep. Increased meat and milk production would need greatly improved nutrition of the animals, with better conservation of grazing and fodder, the introduction of breeds that mature rapidly and the control of disease. In Ankole there are about 250,000 head of cattle, of which at least 50 per cent are infected with tuberculosis. It should not be forgotten that the ruminant is unsurpassed as a machine for the conversion of pasture, inedible by man, to highly palatable human food.

Mr. A. H. Rhodes (Game and Fisheries Department) gave an account of the history of the commercial development of fishing in Uganda. The Game Department was charged with the control of the fisheries in 1933, but as late as 1946 the printed estimates of expenditure included only £75 for "the internal transfer of fish to stock minor lakes with economic species, the purchase of nets, scientific appliances, textbooks and poison for crocodiles". More recently much had been achieved and in 1960 the catch of fish was over 60,000 tons. Of this total one-quarter was exported to the Congo. The distribution of the remainder in Uganda was very uneven, chiefly because of the extreme conservatism of the consumer. Fresh and smoked fish will usually be eaten, but frozen and salted fish are disliked. The education of the consumer could begin in the schools: one or two fish meals a week for 40 weeks could be provided for an annual cost of 5/9d. per head and various kinds of fish and means of preparation could be demonstrated and used: fish farming could be encouraged and fishing tackle provided, with instructions for its use. There were over 7,000 ponds already in existence and they, with the 13,000 square miles of lake, in Uganda and the 500 dams, should be able to ensure a large and regular supply of first-class protein.

Mr. J. Bowden (Kawanda Research Station, Agricultural Department) spoke on the marketing, processing and storage of crops. The change to a cash economy has introduced middlemen, mostly Asian, who collect much of the surplus produce in rural districts, take it to the urban centres and sell to up-country shopkeepers. Much produce in this way finds its way back to its district or origin. Two kinds of groundnut are grown. One is kept strictly for local consumption; the other is normally sold for use in Uganda, especially in Buganda, but is also exported to the oil-extraction market. Exports vary in amount (they were under 4,000 tons in 1959, but 8,000 to 9,000 tons in 1957 and 1960) and could be greatly enlarged. Finger millet and sesame are resistant to insects in storage, but of the other crops, only groundnuts, unshelled, store well if not protected by insecticides. Losses that might amount to several shillings could be prevented by the use of a few cents' worth of 0.4 per cent lindane dust. If storage is safe, the need for urgency of sale is reduced and prices can be stabilized. Also, the producer can keep enough for his whole year's requirements and avoid the necessity for purchases.

Mr. H. W. C. Newlands (Veterinary Department, Entebbe) talked of the marketing of livestock, which is greatly complicated in Uganda by the prevalence of disease, especially rinderpest, bovine pleuro-pneumonia and foot and mouth disease: to avoid spread, extensive veterinary quarantines are maintained on the routes of cattle movement for slaughter. Most of the

slaughter stock is produced in Karamoja, Toro and Lango, and Buganda and Busoga are the chief buying areas. Especially stringent precautions are needed for Karamoja cattle and satisfactory ways of dealing with the large numbers of low-grade cattle from that district are difficult to find. Bone and fish meal cannot be produced cheaply enough to compete on the world market and a canning factory would be a great asset. In the meantime carcasses are being frozen and sent to a cannery in Tanganyika. Milk distribution in Uganda, according to Mr. H. Martin (Uganda Creameries, Ltd.), has recently been greatly expanded by the use of the 'tetrapak', a triangular polythene-lined carton used first in Sweden. The milk is produced in Kenya, is standardized to 3.5 per cent butterfat and is pasteurized by holding at 162° F for 15 seconds. Attempts have been made to find Uganda sources of milk, but so far the amounts offered for sale have been too small for an efficient process.

Mr. H. L. Manning (Namulonge Research Station, Empire Cotton Growing Association) said that the aim of the Station had been to devise a rotation that would use the more reliable first rains for the main food crop and the second rains for cotton. The fertility of the land had to be maintained and the food crops had to mature quickly so that the land could be used for the cash crop. The six-year system now used is: year 1, maize and cotton; year 2, groundnuts and beans; year 3, maize and cotton; years 4, 5 and 6, grazed ley using sown grass (*Chloris gayana*). The system has been devised with regard to the minimum expectation of rainfall for three years out of four, but is not entirely satisfactory; the optimum time for the groundnut harvest is so late that it prevents the early cotton sowing that is so profitable and the bean crop is not only uneconomical, but leaves the ground bare for nearly three months. Mr. Manning concluded by asking whether, from the nutritionists' point of view, beans or groundnuts or some other crops were especially desirable. The agricultural departments needed a firm directive.

Dr. Dean described the Protein Advisory Group, set up by the World Health Organization to encourage work on the utilization of proteins. The use of materials such as groundnut and cotton-seed cake and fish meal involved many difficulties, especially in the standardization of the products: the biological value of the raw materials could be affected in many ways by the treatment, for instance, heating or drying or even storage at room temperature, that they received. Exact specifications and rigid tests of toxicity and of suitability for human food were necessary. Many plant proteins were "incomplete" by themselves, but mixed with other plant proteins and with dried milk had a high value. Many combinations had been tried. The Medical Research Council Unit had tested a mixture of whole ground groundnuts, maize meal, sucrose, cotton-seed oil and dried skimmed milk and it had given good results in the treatment of kwashiorkor. A study of its commercial production had shown that it could be sold for E.A. 80 cents/lb. Many other similar mixtures could be envisaged. For local use a mixture of dried skimmed milk, sucrose and oil was being used in packets that provided 20 g. protein and 400 calories and cost one-third as much as fresh milk. Technical knowledge

had been acquired that enabled such mixtures to be made, but the problem of persuading mothers to use them was extremely difficult.

Dr. H. J. L. Burgess (Nutrition Officer, Uganda Government) described a scheme that had been devised for the distribution of UNICEF dried skimmed milk, based on the amount of malnutrition in each district and the varying hospital and dispensary facilities. The milk was of very little value unless it was regularly incorporated in the child's diet and the number of mothers reattending the distribution centres was so small that much of the milk must be wasted. He discussed the failure to convince the mothers that regular attendance was necessary: the attendance, even without the issue of any supplementary food but with treatment of minor ailments, had a demonstrably favourable effect on children's growth. He had tried the packets of "reinforced milk" (dried skimmed milk, sugar and oil), described by Dr. Dean, in up-country conditions and they appeared to have solved the difficulty of providing a standardized dietary treatment for malnutrition. To prevent malnutrition the mothers had somehow to learn to use to the best advantage the food that the country produced.

Mr. R. M. Bredon (Animal Health Research Station, Entebbe) said that he had analysed over 400 samples of feeding stuffs and found variations in composition that might be of great importance in diets grossly overbalanced by one main item. He thought that standards for products such as maize meal should be enforced and that whenever practicable varieties of plants yielding large amounts of protein should be encouraged. It was important that local foods should be analysed, so that nutritionists should not have to rely on food tables compiled from results obtained from all over the world with the exception of Uganda.

A final group of papers was concerned with some of the wider aspects of nutrition. Mr. D. Ocheng (Kampala) talked of land utilization. He pointed out that the land was used in four main ways: for shifting cultivation, for hunting grounds, for pasture and for more or less stable arable farming. He confined himself to the last and showed that although there were 9.6 acres of cultivable land per head of the population of Uganda, only 1.4 acres was in fact cultivated. Efficient raising of crops and stock, in well-balanced proportions, was needed, but it would be very difficult to achieve unless some way could be found to consolidate the innumerable fragmented and scattered holdings. Under the present system co-operation between neighbours for such measures as stopping soil erosion was almost unknown, yields were far lower than experiment had shown to be possible, production costs were high and profits small. He advocated more extension services, the encouragement of the present nucleus of progressive farmers and improvement of market intelligence: at present traders who knew the country-wide range of prices could make profits by moving food from one area to another, a wasteful procedure. Better education of the farmers and of their wives was essential. Mr. H. Farbrother (Namulonge Research Station, Empire Cotton Growing Association) made an impassioned plea for the ending of reliance on subsistence farming which, he said, was incapable of much improvement. Farm-

ing had to be placed on a cash basis in a true mixed arable-cattle farming system. The three or four hundred progressive young farmers already at work should be multiplied; they represented the chief hope for Uganda's agricultural future.

According to Dr. F. J. Bennett (Department of Social and Preventive Medicine, Makerere College Medical School) eight food patterns could be distinguished in Uganda: the cooking banana-sweet potato-cassava diet of the inter-lacustrine Bantu, that had no element of storage; the cooking banana-millet diet of the Eastern and Western Bantu, who were more and more replacing millet with the banana; the millet staple diet of the Nilotic tribes and the millet and sorghum diets of the cattle-keeping Nilo-Hamites; the millet-cassava diet of the Sudanic tribes; the milk diets of the Hima of Ankole and the cassava-sweet potato-maize flour staple diet of the immigrants from the Ruanda-Urundi. The subsidiary dishes varied widely and so did the amount of milk used. The Iteso and Kuman probably had the best diet in Uganda: it was based on millet porridge, had plenty of variety in the side-dishes and frequently included fish, meat, milk and poultry. Dr. Bennett pointed to various factors of nutritional importance in the country as a whole; the lack of special provision for pregnant women or for children, the small number of meals eaten each day, the occurrence of seasonal shortages, cultural changes, especially the spread of the prestige of the cooking banana and the feeding bottle, and the presence of large numbers of landless immigrants. The introduction of cash crops was changing food patterns as more and more food was bought.

Mr. D. J. Stenning (Institute of Social Research, Makerere) stressed the social significance of eating meals in company; the meals, like observances of prohibitions, were affirmations of solidarity. Despite conservatism changes did occur in the "normal" ideas of correct nutrition, as the adoption of the cooking banana by the Ankole showed; on the other hand, some possibilities of change, believed to be alien, were strongly resisted. Extreme adherence to custom reached its maximum in the pastoral tribes who lived closely with their cattle and who were essentially producers of milk, not of meat as was sometimes thought. The pattern of food growing had been influenced by the introduction of cash crops and sometimes by the new opportunities for paid manual work and the money earned was devoted not to food but to capital and prestige goods. The emergence of a middle class would probably lead to the establishment of new concepts of normality, but much would depend on the nature of the new political authority.

Mr. D. A. Lury (East African Statistical Department, Entebbe) gave an account of the activities of his Department that were of special interest to nutrition workers, including the surveys of expenditure that had provided useful information on how foods were obtained. The population census carried out in 1959 showed that the crude birth rate of Africans in Uganda was 42 per thousand and the general fertility rate of women 16 to 45 years old 187, with very large variations (from 115 to 235) between districts. The infant mortality was 160 per thousand live births and the crude mortality

rate was estimated at 20 per thousand: only 14 per cent of the population were aged 45 years or more. His Department hoped soon to begin a study of registrations of births and deaths, which should gradually become more accurate and so more valuable. Dr. G. S. Murphy (Ministry of Health, Entebbe) spoke of the uses of propaganda. He pointed out that a great deal of nutrition propaganda was absorbed by the peoples of highly developed countries from elements in the environment that had an incidental educational effect, such as constant talk of the value of proteins, the dangers of fats, of obesity and slimming and the omnipresent advertisements for foods. African societies very largely lacked anything similar and he thought that a women's magazine might be a valuable educational device. Formal education in schools would eventually remove many taboos and greatly enlarge knowledge of desirable nutritional practices, but the magazine (and other means of visual and literary propaganda that were being used) also had their place. Miss P. A. Pollard (Education Department, Kampala) dealt with the problems involved in catering for large numbers of people. She thought that schools and other institutions were greatly handicapped, not merely by the small amount of money available for catering costs, but by the lack of facilities for food storage and of skilled catering staff. Much could be achieved by the better distribution of the high-protein foods available in the country. Some foods, such as millet, were being used less than was desirable because they were so difficult to prepare and help on a commercial scale was badly needed: others, such as beans and groundnuts, were extremely variable in price and quality and standardization would be a great advance. Schools should not be encouraged to attempt to grow large amounts of food: the cultivation could not be timed to the school terms and the use of the children's labour was hard to justify. Training for institutional cooks was needed and a much larger range of kitchen equipment should be on sale.

Professor Jelliffe, talking of the problems involved in increasing protein consumption, stressed the need for complete knowledge of culture patterns, of the seasonal availability and cost of foods and of cooking methods. General education, improvement in communications of all kinds, of marketing and money-earning capacity would all play a part, but their effects could not be immediate. In the meantime every effort should be made to persuade parents to give their young children, especially those of one to three years of age, several meals a day, each containing adequate amounts of protein. To bridge the gulf between the end of breast feeding (which should be prolonged) and the time when the adult diet was satisfactory, all the available animal protein should be used in forms that the child could take and suitable vegetable protein mixtures should be used. He described the *ettu* pastes he was trying to introduce: they were cooked, in the way that the Baganda and other tribes cook most of their foods, in packets of banana leaves and could consist of a wide range of mixtures: for instance, cooking bananas and groundnuts, sweet potatoes and beans, or sweet potatoes and groundnuts. Other sources of protein, such as dried milk, eggs, fish and edible insects could also be incorporated. He thought it should be quite clear from what had been said

of the amount and diversity of foods available in Uganda that there should be no kwashiorkor in the country.

In his summary of the Conference Dr. Dean said that the nutritional problems of Uganda must always be considered strictly in their local context: they were not the nutritional problems of present-day Europe and it might be that the agriculturalists' insistence on the necessity for mixed farming, an excellent idea for Europe, could usefully be questioned in Africa. He emphasized that one of the great values of Professor Jelliffe's *ettu* pastes was that they were evolved within local patterns of culture. It was obvious that there was plenty of food in Uganda and with measures such as land consolidation, better storage and the use of improved husbandry, even more could be obtained. The reluctance of the African to change his ways had been mentioned repeatedly, but it seemed that insufficient thought had been given to the question of why there was resistance to change. If another similar Conference were held, perhaps it would be wise to enlarge on the social aspects: it was obviously agreed that a full knowledge of the relationship of man to his environment was one of the great nutritional necessities.

SUMMARY

Short accounts are given of the papers presented at a Conference held in 1961 on the provision and use of proteins in Uganda.